Education and Youth Crime:
A review of the Empirical Literature

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Abstract

This paper provides a systematic literature review on the relationship between education and criminal behavior of young people, using the Technology of Skill Formation (Cunha & Heckman, 2007) as a theoretical framework. The nature of youth crime is different than the nature of adult crime. We analyze studies that evaluate childhood and adolescence interventions and studies that examine the effects between education and criminal behavior of young people. The former suggests a link between education and youth crime. The latter shows that education reduces the probability of criminal behavior in adolescence and young adulthood, whereas early criminal involvement is likely to have a negative impact on educational attainment. The underlying mechanisms of these effects are generally not identified and can combine different components, such as incapacitation effects, skill acquisition and peer effects.

JEL-classification: I21, I28, I29, K14, K49.

Keywords: education; criminal behavior; interventions; youth; causal evidence.

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1. Introduction

Early school leaving and criminal behavior of young people are two important concerns in every community as they can result in individual and public losses. School dropout is associated with lower economic growth, youth unemployment, decreases in gross income and with higher crime rates as well (see Psacharapoulos, 2007). Crime can also increase the unemployment rate of the community (Calvó-Armengol & Zenou, 2003) and have a negative impact on economic growth in the region (Detotto & Otranto, 2010). Crime generates substantial social costs, through criminal justice system spending, security expenditures, costs to repair damages, victimization costs and health services costs. Criminals themselves face costs associated with criminal charges, can suffer from social stigma or social exclusion (Hannon, 2003), and experience a decline in earnings and employment following an arrest or imprisonment (see Lochner, 2004).

Criminal behavior in adolescence can have strong links to future negative outcomes, among them adult crime, low academic performance and early school leaving. At the same time, school dropout can encourage juveniles to become involved in criminal behavior. From the one hand, lower educational attainment and criminal involvement can develop a dynamic interrelationship. From the other hand, many mutual confounding factors can determine both education and criminal behavior and it can be difficult to isolate a single chain of causality. Insight in how education and youth crime is casually related may indicate possible measures to reduce crime and educational inequality in society.

The aim of this study is to provide a comprehensive and unambiguous literature review on the relationship between education and criminal behavior of young people. The terms “youth”, “young people”, “adolescents” and “juveniles” are used here interchangeably. The concept of education is used in its broad sense and, depending on the context, can refer to educational attainment, school attendance and academic performance. Finally, youth crime refers to any interactions with the criminal justice system as a result of criminal behavior, and can also mean antisocial or risky behavior of juveniles such as substance abuse and precocious sexual behavior.

We discuss how education and youth crime can relate to each other from a theoretical and empirical perspective. The Technology of Skill Formation serves as a theoretical framework to analyze this relationship. This theory captures all main approaches that underline criminal behavior. Empirical studies on early childhood interventions, interventions in early school age, and adolescence interventions provide evidence on programs that aim to
improve education and prevent or reduce criminal behavior of young people. The empirical literature that examines the effects between education and youth crime provides further insights into this relationship.

The contribution of this study is twofold. First, it documents and analyses the existing evidence on the relationship between education and criminal behavior of young people. Most previous studies in this field have focused on examining the effects of education on criminal behavior of adults. We note that the nature of youth crime and adult crime can be different. Preventing crime in adolescence may have an impact that lasts throughout adulthood, including behavioral and educational outcomes.

Causal evidence on the relationship between education and youth crime is especially important from a policy perspective. To develop effective policies aimed at reducing school dropout and youth crime rates, it is crucial to rely on causal evidence. Therefore, as the second contribution, we attempt to distinguish between causal and correlational studies that analyze the relationship between education and youth crime.

This paper is organized as follows. Section 2 discusses the nature of youth crime. Section 3 provides a theoretical basis underlying criminal behavior in a relationship to education. Section 4 outlines the search strategy and selection criteria of empirical studies used in this review. Section 5 describes childhood interventions, interventions in early school age and adolescence interventions and their effects on educational and criminal behavior outcomes. Section 6 discusses empirical studies that examine the effects between education and youth crime. Finally, Section 7 sums up the findings of this study and provides suggestions for future research.

2. The nature of youth crime
The age-crime curve shows that the peak age of criminal behavior is in adolescence, between age of 15 and 19 (Farrington, 1986; Piquero et al. 2007; Bosick, 2009). Young people involved in criminal behavior in adolescence are usually dealt with in juvenile justice system (see Goldson and Muncie, 2006; Loeber et al., 2013).

The vast majority of existing studies on the relationship between education and crime do not consider differences between age groups, and have a mixed-age research population. However, and as is shown below, youth crime can differ from adult crime in several respects, and therefore its relationship to education might be also different.

First of all, young people appear to be involved in a greater variety of criminal behavior, but also less serious and less sophisticated crime, compared to adults (Junger-Tas et
al., 2010). For example, the most frequent arrests among U.S. youth are for minor crimes against property, vandalism, drugs dealing, disorderly conduct, and obstruction of justice (Puzzanchera et al., 2010). In European countries, group fighting, carrying weapons, drugs dealing, shoplifting, vandalism and computer hacking predominate (Junger-Tas et al., 2009).

Secondly, young people and adults can differ in their motivation to exhibit offending behavior. In accordance with the economic theory, adults have an economic interest to be engaged in crime (see Becker, 1968; Lochner & Moretti, 2004; Lochner, 2011). Although adolescents tend to report that the main motivation of their criminal involvement is gaining economic and financial benefits, there are many other reasons of their criminal behavior, such as, enjoyment, excitement, entertainment and pleasure (Goldson & Muncie, 2006; Farrington, 2001). Luallen (2006) considers that mischief crimes committed by juveniles “often result from boredom rather than calculated criminal thought” (p. 88). Similarly, Scitovsky (1999) believes that violence in school largely occurs due to feelings of boredom and a lack of activities at school. Peer group pressure, mood swings, and lack of reflection on emotional situations are significant factors that can stimulate offending behavior of juveniles (McCord et al., 2001). Finally, a criminal act is frequently viewed by young people as a risk-taking adventure that gives offenders status and particular respect within their group of peers (Cohen, 1955).

The third distinct aspect of youth crime is that adolescents are relatively more likely to commit crime with others or in groups compared to adults (see Zimring, 1981; Greenwood, 1995; Reiss, 1988). In contrast to adult criminal associations, groups of juvenile offenders are typically formed by territorial affiliation, and they are usually random and less stable over time (Reiss, 1988). Therefore, social interactions at school and on the street seem to have a great impact on behavior of young people. Juveniles are more likely to co-offend with individuals of the same gender and the same age group compared to adults (Reiss, 1988). Similar to adult crime, young males participate in criminal activities more often than young females (Levitt & Lochner, 2001).

Finally, the timing of youth crime varies with the type of offence (see Gottfredson & Soulé, 2005; Taylor-Butts, 2010). Police-reported crimes against persons typically occur during after-school hours (Snyder & Sickmund, 1999), and more specifically, between three and six o’clock in the afternoon (Newman et al., 2000; Taylor-Butts, 2010). However, Gottfredson and Soule (2005) argue that violent offenses during school hours are the most frequent. By contrast, the peak of violent crime among adults is between midnight and three o’clock in the morning (Taylor-Butts, 2010). Furthermore, youth violence tends to decrease
on weekends when young people are interacting less with their peers (see Jacob & Lefgren, 2003) while violent adult offences are increasing during weekends (see Falk, 1952; Briscoe & Donnell, 2003).

The above-mentioned differences between youth crime and adult crime suggest that the relationship of youth crime to education may also be different. Moreover, criminal involvement of young people can influence their educational attainment, while the impact of adult crime on educational attainment is less likely.

3. Theories underlying criminal behavior and its link to education

The theoretical literature that focuses on the underlying mechanisms of criminal behavior distinguishes among biological, psychological, sociological (see Reid, 2011) and economic mechanisms (Becker, 1968; Freedman, 1999). The Technology of Skill Formation of Cunha & Heckman (2007) captures these different theoretical mechanisms. An adapted version of their model is represented by the following equation:

\[
\theta_t = m(\theta_0; \theta_{t-1}, I_1(s, g, e, I_{t-1}), ..., I_T(s, g, e, I_{T-1}, \theta_{T-1}); X_t) \quad t = 1, ..., T.
\]

where \( \theta_t \) represents the acquired skills on a time period \( t \). The equation shows that the acquired skills in period \( t \) are influenced by \( \theta_{t-1} \), the acquired skills in period \( t-1 \). This framework implies the dynamic nature of cognitive and socio-emotional development: different skills and the same skill in different periods are strongly related. Hence, skills related to education and skills related to criminal involvement can be in close connection, and can influence each other over time. Skill attainment at one stage of the life cycle raises skill attainment at later stages of the life cycle, which is referred to as self-productivity. Furthermore, investments in skills at different stages of the life cycle can be complementary, as later investments built upon the effectiveness of earlier investments (Cunha & Heckman, 2007).

A specific situation occurs in the first period, where the model indicates that the acquired skills are influenced by \( \theta_0 \), which represents innate child characteristics. Biological theories consider criminal behavior as the result of biological deviations. Examples of such biological deviations are genetic predisposition to crime, brain abnormalities (e.g. brain damage and poor brain functioning), and neurotransmitter dysfunction (see Raine, 2002). Because biological deviations may also occur during the lifetime, we included \( X_t \), a factor
that indicates that certain circumstances in the life time may influence the skills acquired in that period.

Psychological and psychoanalytical theories relate criminal conduct to the emotional and intellectual development of individuals, information processing and personality traits. Especially, the role of early childhood experiences is emphasized (see, among others, Bartol, 2002). Innate psychological characteristics are therefore also represented by $\theta_0$, while psychological development factors that occur over time are captured by $X_t$.

The $I_t$ functions indicate that parents, peers and schools ($s$), as well as governments ($g$) invest in the child’s development. The size of investments varies over the $T$ time periods and therefore the $T$ investment functions appear in the skills production function. Investments depend on previous performances, such as skills and social behavior, and captured by $\theta_{t-1}$.

As is argued by Cunha and Heckman (2007), current investments are more promising when previous investments, $\theta_{t-1}$, were made. Also, the investments are more likely to be made if there were successful earlier investments. We conveniently assume that investments (acquired skills) in period $t$ are only influenced by the investments (acquired skills) one period earlier, while in reality it is likely that all past investments and acquired skills are of importance.

Sociological theories underline the significant role of sociological background factors ($s$). Criminal behavior is explained from the social-organization and social-process perspectives (see, Reid, 2011). The former assumes that criminal behavior and acquired skills depend on variables related to the social structure (e.g. school social bonds, school climate). The latter relates criminal behavior to social learning, labeling, and social control (see Reid, 2011).

Economic theories consider criminal acts to be the outcome of a rational decision process in which the costs and benefits are rationally weighted (Becker, 1968; Freedman, 1999). Therefore, effort, $e$, is one of the factors that determines the amount of investment in a particular period. Economic models predict that individuals compare the costs (effort) of skills acquisition (and the benefits generated by these skills) to the costs (and benefits) of criminal behavior.

To conclude, the Technology of Skill Formation framework enables us to consider the relationship between education and criminal behavior of young people in a dynamic way.
Presumably, education and criminal behavior can be related at a single point in time and their development can be strongly intertwined over time.

4. Literature search strategy and selection criteria
In order to find evidence on the relationship between education and youth crime, we conducted a systematic literature review. In our search, we used different combinations of keywords which are grouped as follows: a) children, juvenile(s), adolescent(s), youth, young people; b) crime, delinquency, offending, arrest, incarceration, antisocial, risk-taking, violence, substance abuse, behavior, involvement, engagement, activities; c) education(al), school(ing), academic, dropout, early-school leaving, truancy, (non-)cognitive abilities, IQ, performance, attendance, attainment; d) early childhood, adolescence, after-school, out-of-school-time, stimulation, intervention, experiment, program.

The empirical literature was searched using the following electronic databases and search engines: Elsevier, Google Scholar, Google Search, ERIC, EconLit, PsychLit, Science Direct, SAGE’s, JSTOR, Social Science Research Network, Economic Papers, Wiley, Springer, and Taylor & Francis. In this review, we considered peer-reviewed studies, discussion papers, working papers, reviews and research reports that were accessible online before October 2013. Non-published empirical studies were included because there is little rigorous research that focuses on the effects between education and youth crime.

The content of the literature we analyzed qualitatively. There were two specific criteria for inclusion of intervention studies. First, only interventions that have follow-ups in adolescence (or young adulthood) were selected, and that measure effects on both educational and criminal behavior outcomes. Second, only studies that have a randomized controlled trial or that use a comparable control group were included. With regards to literature that examines the effects of education on youth crime, only studies that aim to find causal effects were included. The studies on the effects of early criminal behavior on educational outcomes are generally rare, and therefore, we included all rigorous studies that analyze such effects.

As a result of this search and selection, in total 38 studies that evaluate 9 childhood interventions, 3 interventions in school age and 7 adolescence interventions were identified as relevant for this systematic literature review. With regards to studies that examine the effects between education and youth crime, we selected and discussed 10 studies that analyze the effects from education to youth crime and 3 studies that examine the impact of early criminal involvement on educational outcomes.
5. The effects of interventions on educational and criminal behavior outcomes

During the last decades, a number of social interventions have been implemented that were aimed to develop skills and prevent problem behavior of at-risk youth, predominantly from families with a low SES and from ethnic minority groups (see Blau and Currie, 2006; Olds et al., 2007; Decovic et al., 2012; Durlak et al., 2011). We review a number of intervention studies in order to establish a link between education and criminal behavior of young people. The selected interventions and studies that evaluate them are presented below, and also in the tables attached to this section. The tables provide information on early childhood interventions, interventions in early school age and adolescence interventions. In left to right order, the columns illustrate when and where an intervention occurred, target group of the intervention, age of participants, content of the intervention, duration of the intervention, evaluation design and the age of participants at follow-up. The last columns show the effects of the interventions on educational outcomes (i.e. academic performance, educational attainment) and criminal behavior outcomes.

5.1 Early childhood interventions

According to the Technology of Skill Formation theory, investments in early childhood education provide an essential basis for further investments. A significant part of the interventions has been aimed at children aged between 0 and 6 years old. Typically, early childhood interventions do not only target the children, but do also target the whole system that surrounds the child’s development. Table 1 sums up evidence on early childhood interventions.

The Nurse-Family Partnership (NFP) and the Infant Health Development Program (IHDP) are programs provided to low socioeconomic status families with new-born children. Both programs include home visits during mother’s pregnancy and services for infants and toddlers (birth to three). The IHDP also offers center-based care for children and parent group meetings. The main aim of these programs is to reduce negative intergenerational effects (e.g. low education, risky behavior, unemployment) from parents to children. These programs were rigorously evaluated using randomized controlled trials and had several follows up. The evidence shows that there is no effect of the NFP on academic performance or educational attainment, but the program does reduce offending behavior of girls (Eckenrode et al., 2010). The IHDP had no significant effect on criminal behavior of juveniles aged 18, the effects on academic performance are mixed and there is no significant effect on educational attainment (McCormick et al., 2006).
The Jamaican Study is another infant intervention with similar content. It was targeted at 129 children aged between 9 and 24 months who came from poor disadvantaged neighborhoods in Jamaica (Walker et al., 1990). The program provided nutrition supplementation and psychological stimulation by weekly home visits by community health assistants. The psychological stimulation was based on mother-child interaction. It included play sessions with a child and the mother and sessions only for the mother to teach her how to promote the child development through play. The results show that the intervention, especially psychological stimulation, has a positive effect on educational outcomes at age 11-12 and sustain through age 17-18 and 22 (Walker et al., 2005, 2011). Walker et al. (2011) find that participants in the Jamaican program who received stimulation were less involved in fights and in serious violent behavior at the age of 22.

The Carolina Abecedarian Project (ABC) and the Carolina Approach to Responsive Education (CARE) are early childhood interventions targeted at children aged between 6 weeks and 8 years old. The sample of children in the ABC project included developmentally at-risk children (N=110) while children in the CARE (N = 66) were from high-risk and low-risk families. The ABC project offered full-time center-based childcare. The CARE project had two types of interventions: (1) center-based childcare combined with home visits, and (2) home visits only. The results show that the ABC program has positive effects on educational outcomes but no effect on criminal behavior on young people. CARE positively affected academic performance and reduced marijuana use for participants of the program (Clarke and Campbell, 1998; Campbell et al., 2002).

There are interventions that are specifically aimed at preparing children for school. The most well-known of such interventions is the High/Scope Perry Preschool Program. 128 children from deprived African American families with low IQ scores (below 85) were randomly assigned to a treatment and a control group. Participants of the treatment group regularly (biweekly during four years) received home visits by the teacher until they were of school age. The study followed 123 individuals over a longer period and showed that preschool education had positive effects on educational attainment of females, but not for males, and that it reduced criminal behavior of all participants (Schweinhart & Weikart, 1997; Schweinhart et al., 2005; Heckman et al., 2010). However, the program was targeted at a very specific group of children and these results are therefore may be not representative for different populations.

The Chicago Child-Parent Center (CPC), the large-scale programs Head Start and the small-scale program Syracuse Family Development Research Program (FDRP) were not
based on randomized control trials. However, these interventions were evaluated rigorously. For instance, in the evaluation of CPC another disadvantaged area of Chicago was used as the control group, by applying matching techniques (Reynolds & Temple, 1995; Reynolds et al., 2001). All three programs provide home visits for children from low socioeconomic families with the aim to better prepare them for school. In addition, day care was provided in the FDRP program. The studies that evaluated Head Start show positive but weak effects on education of participants while effects on criminal behavior are mixed (Garces et al., 2002; Deming, 2009; Currie, 2001). The CPC positively affected academic performance, educational attainment and reduced arrest rate (Campbell et al., 2002; Barnett, 2008; Reynolds et al., 2001). The effect of the FDRP also improved academic performance and reduced criminal involvement (Lally et al., 1988).

We conclude that the common feature of the early childhood interventions is that they are aimed at cognitive and socio-emotional development of at-risk children from the earliest stage of life. Children are provided with similar services that involve social, mental and psychological stimulations. It is, however, difficult to distinguish which components of these interventions are the most effective. Even though not all early childhood interventions reduced criminal behavior and improved educational characteristics, evidence generally shows that investing in children at an early age, especially in at-risk children, can improve their future educational outcomes and reduce criminal behavior.

[Table 1 is around here]

5.2 Interventions in early school age
Interventions in early school age are often aimed at improving academic performance of students and at the regulation of relationships between students and their peers, teachers, and parents. The selected interventions and studies that evaluate these interventions are presented in Table 2.

The Seattle Social Development Project (SSDP) is a long term project aimed at children’s development in public elementary schools. This program included in-service teacher trainings, parenting classes for parents and social competence training for children. This project targeted 808 pupils who were enrolled in fifth grade. The follows-up suggests that the SSDP improved education while the effect on criminal behavior is mixed (Hawkings et al., 2001, 2005).
The Montreal Longitudinal Experimental Study (MLES) was conducted amongst at-risk boys aged between 7 and 9 years from low socio-economic status families. The interventions provided social skills trainings to children, their parents and teachers by professional social workers. For example, parents received special training programs on how to better supervise children’s behavior, train their non-cognitive skills, use non-abusive discipline strategies and manage family crises. At the end of primary school, boys from the treatment group had a significantly lower fighting score, were less likely to have serious behavioral and performance problems at school compared to the boys in the non-treated groups. They were also less likely to commit thefts and delinquent acts involving trespassing (Tremblay et al., 1992, 1996). Another study shows that children who participated in the program were more likely to graduate from high school, while there was no effect on the probability of having a criminal record (Boisjoli et al., 2007).

The Los Angeles Better Educated Students for Tomorrow program (LA’s BEST) is an after-school enrichment program that aims to provide a safe and supervised environment for students at-risk in disadvantaged neighborhoods. It is designed for children in kindergarten through fifth/sixth grade. LA’s BEST focuses on cognitive, non-cognitive and physical development of children and include a number of learning and social (e.g. enrichment and recreation) activities such as a homework assistance, tutoring services, a library services, sports, arts and crafts and group activities. The program is not rigorously evaluated by means of a randomized control trial, but instead the evaluation studies apply a propensity score matching method. The evaluation results suggest that the program has an effect on educational attainment, but not on academic performance (Huang et al., 2008, 2009). The program also had a favorable impact on criminal behavior, however only for those who attended the program most frequently (Goldschmidt & Huang, 2007). However, these studies do not address the issue of selective program attendance.

We conclude that the reviewed studies suggest that well-established interventions in early school age can contribute considerably to improving educational outcomes through adolescence while the effects on criminal behavior are not clear. Perhaps, more such interventions need to be evaluated in order to make a stronger conclusion with regards to its effects on criminal behavior as well as the mechanism of these effects.

[Table 2 is around here]

5.4 Adolescence interventions
Adolescence interventions are often aimed at preventing criminal involvement or low educational attainment of at-risk juveniles. The selected interventions and evaluation studies are documented below and in Table 3.

The Big Brothers Big Sisters program (BBBS) is a mentoring program for juveniles aged between 10 and 16 who live in disadvantaged families (e.g. single-parent). The program provided regular meetings of volunteer mentors with participants of the program. The empirical results suggest that the program has a strong effect on academic performance (however, only for girls) and reduces violence in school and substance abuse (Tierney et al., 1995; Grossman & Tierney, 1998).

The Quantum Opportunity Project (QOP) provided mentoring, educational services and financial rewards to juveniles at-risk aged 14 or 15. The program’s activities were performed out-of-school time. Students from the treated group were promised that they would receive a financial reward if they obtain a high school diploma (or GED) and if they continue their education at the postsecondary level. The results of the program show that adolescents in the treatment group graduated high school earlier and were more likely to continue postsecondary education compared to adolescents in the control group. The intervention had a reducing effect on criminal activity for youth in the top-half of the risk distribution and this effect persisted up to 5 years after the program. The program, however, was not effective for youth in the bottom-half of the risk distribution (Rodríguez-Planas, 2012).

The National Guard ChalleNGe and Job Corps are large-scale programs that provided residence-based education and job training for young people at-risk (often school drop-outs). From the beginning of the 1990s these programs involved thousands of participants. The empirical results show that participants were more likely to obtain a GED certification, but not a high school diploma (Bloom et al., 2009; Millenky et al., 2011, 2013; Schochet et al., 2008). The favorable effect on arrest and conviction of these programs was only observed during the intervention when young people were enrolled in residence-based education and training and show no lasting effect on crime in the long-run (Schochet et al., 2008; Millenky et al., 2011).

The Education Maintenance Allowance (EMA) program was designed to increase participation, retention and achievement in post-compulsory education among young people aged 16-18 in the U.K. by means of a weekly monetary allowance (provided to young people or their parents). Areas with low participation in post-compulsory education and areas with higher levels of economic deprivation were selected for this intervention. In evaluation studies, individuals from areas that participated in the EMA program were matched to
individuals from control areas with similar characteristics. The results show that the EMA has a positive effect on participation in education, in particular in urban areas (Ashworth et al., 2001, 2002; Heaver et al., 2002). The program also has a negative effect on burglary and theft conviction rates among young people aged 16-18, while there is no effect on convictions rates for violent crime (Feinstein & Sabates, 2005). The authors explain this effect by a direct income effect on crime reduction due to the income support provided to youth and by incapacitation effects of education.

“Becoming a Man” (BAM) is an intervention provided for at-risk youth from high schools in the Chicago Public School system, which is located in low-income, racially segregated and with high crime rates neighborhoods. The intervention included in-school programming, after-school programming, or both, exposing young people to pro-social adults, keeping them busy during the high-risk after-school hours, and implementing aspects of cognitive behavioral therapy. The results of an evaluation study suggest that program participation reduced violent-crime arrests during the program year and generated substantial gains in schooling outcomes, leading to higher graduation rates (Heller et al., 2013).

The Het Alternatief (Halt) program is a Dutch afterschool program that aims to prevent delinquent juveniles from re-offending and to improve their social behavior. The participants of the treatment group had to perform different working and learning activities in the after-school time, such as community work, apologize for their behavior or write an essay. The evaluation study shows mixed results with regards to a reduction of criminal behavior (Ferwerda et al., 2006). Nevertheless, a study that evaluates the effect of Halt on educational outcomes suggests that Halt has a significant positive effect on educational attainment and it is likely to reduce the probability of early school leaving (Rud et al., 2013).

Evidence on extended school days suggests a statistically significant reduction in offending behavior of juveniles during high-risk (after-school) hours (e.g. Aizer 2004; Riggs & Greenberg, 2004). Aizer (2004), for instance, finds that young people with adult supervision are less likely to be truant and less often commit minor offences. This study shows that adult supervision after school makes young people less likely to use alcohol and drugs, participate in property and violent offences. After-school programs are likely to help young people to solve many behavioral problems and have overall positive effects on social skills and emotional development of young people (see Durlak at el., 2011). Finally, it is worth mentioning the role of recreational activities as a part of educational programs that reduce violence and aggression among high-risk youngsters. In particular, the longitudinal
study by Caruso (2011) shows a robust negative association between participation in sport-related programs and youth crime.

We conclude that adolescence interventions aimed at at-risk juveniles can improve their educational outcomes. The effects on criminal behavior outcomes are rather mixed, although incapacitation effects of the education and training programs clearly reduce participation in criminal activities. However, the exact mechanisms of how adolescence interventions can affect educational and behavioral outcomes are not identified, and we can speculate that the social control, incapacitation and educational components might be the main paths for these effects.

[Table 3 is around here]

5. **Empirical studies on the relationship between education and youth crime**

In this section, we further explore how education and youth crime are related. We start with documenting the empirical results of studies that examine the effect of education on delinquent involvement and then discuss the empirical results of studies that evaluate the impact of early criminal behavior on educational outcomes. Table 4 and Table 5 present these two types of studies, respectively. These tables provide the following information: name of the study, country of the study, research population, sample size, the evaluation method of the study, what is the input variable and the effects on criminal behavior outcomes (Table 4) or educational outcomes (Table 5).

6.1 **The effects of education on youth crime**

Many studies suggested that truancy and school dropout are negatively related to the probability of criminal behavior (e.g. Elliott, 1966; Thornberry et al., 1985; Jarjoura, 1993, 1996), however, this association can become insignificant after controlling for certain background characteristics (e.g. Bachman et al., 1978; Krohn et al., 1995). Therefore, studies that establish a causal relationship between education and youth crime are of particular importance.

The empirical evidence showing that educational attainment negatively affects adult crime is growing (e.g. Lochner & Moretti, 2004; Machin et al., 2011; Groot & Maassen van den Brink, 2010; Meghir et al. 2010). However, little rigorous research has been conducted on the effects between education and youth crime (see Belfield & Levin, 2009; Lochner, 2010;
This can be explained that youth crime is not always measured accurately and that there can be many confounding factors such that isolating a single chain of causality is difficult (Belfield & Levin, 2009).

There are several studies that focus on the incapacitation effect of education on criminal involvement of youth. Jacob and Lefgren (2003) use teacher in-service days during the regular school year in the U.S. as a source of exogenous variation in students’ school attendance. On teacher in-service days students do not attend school but teachers attend, conducting organizational tasks. The researchers discuss that these days are unlikely to be correlated with factors that influence criminal activity. The results of their study suggest that property crime committed by young people aged between 10 and 19 decreases with 14 percent, but incidents of violent crime increase by 28 percent on school days compared to teacher in-service days.

Luallen (2006) expresses doubts on that teacher in-service days is an exogenous source of variation in student absence from school, and argues that such days are usually known in advance and therefore juveniles may plan crime on a free of school day. The researcher replicates the study by Jacob and Lefgren (2003) using teacher strikes as an unexpected source of school closing. For this purpose, Luallen (2006) apply data that measure criminal activities reported at the zip code level by linking them to the corresponding school districts. The results of this study are similar to those of Jacob and Lefgren (2003), but the magnitude of the effects is larger. In particular, the study shows that school incapacitation reduces property crime with approximately 29 percent, and that violent crime increases with a percentage that lies between 32 and 37 percent. The additional tests show that these effects only hold for urban communities. The study also suggests that the decrease in violent crime during teacher strike-days mainly results from offenders who usually commit multiple crimes, while the increase in property crime is driven by school absenteeism of both one-time and repeat offenders.

Landersø et al. (2013) explores the relationship between educational incapacitation due to early start and later graduation of compulsory education on the likelihood of criminal behavior of adolescents. The researches use Danish register-based data and variation in school starting age generated by administrative rules, arguing that this variation is exogenous. They find that higher age at school start lowers the propensity of criminal behavior before age 18 and this reduction is caused by incapacitation effects of education. Their study also suggests that this effect is not homogeneous across gender: property crime is reduced for boys while violent crime is reduced for girls. Besides, the effect for boy with high levels of latent abilities
is higher. Finally, they conclude that “the effects are not caused by relative age of peers but by one’s own school starting age” (p. 27).

A second literature focuses on the effects of increased educational attainment on criminal behavior probabilities, even though this relationship may include different underlying mechanisms, such as skill acquisition and educational incapacitation as well.

Åslund et al. (2012) study the impact of a large scale Swedish reform in vocational education on criminal convictions among youth. The reform extended vocational upper secondary education from two to three years and added more general theoretical content. The authors argue that this reform concerned age groups where criminal activity is relatively high and students who are overrepresented in crime statistics. The results of this study show that increased access to prolonged and more theoretical vocational education leads to a persistent reduction in property crime, but not significant decrease in violent crime. In particular, three-years vocational programs lead to a reduction in property crime among students by a 1.8 percentage point, compared to no three-year vocational programs.

Anderson (2012) analyses the relationship between education and youth crime using state-level variation in the minimum dropout age (from age 16 to 17 or 18) in the U.S. In particular, changes in the compulsory schooling law are used in a difference-in-differences framework to control for unobserved heterogeneity and endogeneity bias. The results show that higher educational attainment due to a change in the compulsory schooling law reduces arrests of young people by roughly 10 percent.

Machin et al. (2012) identify the effect of educational attainment on youth crime using the reform in post-compulsory education system in the late 1980s and early 1990s in the U.K. as a source of exogenous variation in educational participation of young individuals aged between 16 and 21. This reform increased the number of individuals that stayed in education. The criminal data used for this study come from on a randomly selected sample of offenders. The results show that a one percent increase in the proportion of males in full time education and a one percent increase in the proportion of men staying in education after the compulsory school leaving age reduces criminal behavior of young men by around 1.9 percent and 1.7 percent, respectively. This reduction is also present for women, although smaller in magnitude, 1.1 percent and 1.3 percent, respectively.

Brugård and Falch (2012) exploit Norwegian data on educational characteristics and detailed data on imprisonment for persons aged between 21 and 22 to analyse the relationship between education and youth crime. They use exam results as an instrument for skills, and the study track structure together with proximity to high schools as instrument for the number of
semesters in high school education. The results of this study suggest that an additional semester in high school reduces the probability of imprisonment by 0.44 percentage points.

Merlo and Wolpin (2009) provide a comprehensive analysis of the dynamic interactions among a youth’s schooling, employment and criminal behavior decisions and criminal involvement outcomes. They use individual-level panel data reported by the Afro-American male population aged between 13 and 22 in the U.S. To estimate youth’s decisions to engage in schooling, employment and criminal behavior (including all possible combinations of these three activities), they apply a multinomial discrete choice vector autoregression model. They use the estimates to account for unobserved heterogeneity and state dependence (past choices and outcomes). Furthermore, they simulated the effect of changing schooling status at age 16 for the same individuals and compare their criminal involvement. They conclude that not attending school at age 16 (implying school dropout) increases the likelihood of committing crime and being incarcerated at age 19-22 by up to 14.8 percentage points and up to 8.1 percentage points, respectively.

A third literature focuses on the effects of post-secondary school attendance on criminal behavior of young people. Cullen et al. (2006) evaluate the effects of winning a lottery that allows high school admission in the Chicago Public Schools on educational and criminal behavior outcomes. The study shows that although winning the lottery increases enrollment and attendance in the high schools, there are no positive effects on other educational outcomes. This can be explained that there is a mismatch between student ability and school requirements (Lochner, 2010). There is, however, a negative effect on self-reported disciplinary incidents and registered arrest rates. Self-reported arrest rates are reduced by about 60 percent among lottery winners relative to lottery losers.

Deming (2011) examines the effect of winning a school lottery to attend a first-choice school (middle or high school) in the U.S. on criminal activity. The results of this study suggest that winning the lottery reduces crime that measured 7 years after random assignment, namely, high-risk youth who won the lottery commit about 50 percent less crime compared to youth who did not win the lottery. Besides, the reduction is crime occurs after juveniles are graduated from their preferred school. This effect persists 4-7 years after random assignment in both the middle and high school. This effect can be explained by the returns to investment in schooling, higher educational attainment and increase the opportunity cost of crime for young people who won the lottery (Deming, 2011; Lochner, 2004). The study also suggests “evidence that the impacts of high school are more attributable to gains in school quality, whereas the results in middle school are driven more by peer effects” (Deming, 2011, p.
However, it is possible that juveniles (and their parents) can self-select themselves into better schools and therefore the impact of winning the lottery can be driven by match-specific peer effects.

To sum up, the reviewed and documented above studies reveal causal evidence on the negative effect from education (including school attendance and educational attainment) to youth crime. Furthermore, these studies suggest that the effect of education can be direct (through incapacitation) and indirect (e.g. through skill acquisition). More evidence on the driving forces of this effect would benefit the research.

[Table 4 is around here]

### 6.2 The effects of criminal behavior on educational outcomes

This section summarizes the empirical results of studies that focus on the effects of early criminal involvement on educational outcomes.

Hjalmarsson (2008) analyzes the relationship between previous criminal involvement and high school graduation by age 19 on the data from the U.S. This study uses a linear probability model and controls for a large set of observable characteristics, and also takes into account the state and household fixed effects. The results suggest that arrest and incarceration at age 16 or earlier significantly reduce the probability of graduating high school by about 11 and 26 percentage points, respectively. In addition, Hjalmarsson (2008) uses techniques proposed by Altonji et al. (2005) to assess the sensitivity of these effects. This exercise suggests that the effect of incarceration is relatively more robust than that of arrest, and it is likely to represent a real effect.

McGarvey et al. (2008) examine the relationship among school and neighborhood crime and school academic outcomes using school-level data from a large urban district in U.S. which were merged with crime data. In the instrumental variable estimation, they apply a set of instruments such as total number of adults in the school, distance from school to the nearest public housing, distance to public transport and other factors. The authors claim that these factors affect school outcomes only through their correlation with crime and socioeconomic status. Their study suggests that school violence and neighborhood violence have separate negative effects on school outcomes. In particular, an additional violent incident in a school is associated with a 4 percentage point decline in academic pass rate (referred in the paper as CRCT and denotes the proportion of students meeting or exceeding standards in grades four and six).
Webbink et al. (2012) analyze the relationship between criminal involvement and educational attainment using variations within pair of twins from the Australian Twin Register. They find that being arrested before the age of 18 results in 0.7 to 0.9 fewer years of education and lowers the probability of finishing high school with 20 to 23 percentage points. The study, furthermore, shows that the impact of being arrested on educational attainment is largest for children who were arrested between the age of 13 and 15 years old. However, although twins are genetically similar, there can be underlying factors of their different treatment status and these factors can also influence educational outcomes differently.

These studies, in general, suggest that the reverse causality between education and youth crime is possible. At the same time, stronger evidence on the effect from early criminal behavior to education is needed to make a conclusion about the causal effects.

[Table 5 is around here]

Conclusion
This study provides a systematic literature review on the relationship between education and youth crime using the Technology of Skill Formation is used as a theoretical framework. This theory enables us to consider that education and youth crime are related in a dynamic way.

We first discussed studies that evaluate the effects of childhood and adolescence interventions on educational and criminal behavior outcomes. We find that early-childhood programs that focus on children from disadvantaged families tend to improve educational outcomes and reduce criminal behavior of young people. Interventions in the early school age and adolescence interventions show positive effects on educational outcomes while the effects on youth crime are mixed. In general, existing evidence suggests that early interventions are more effective than later interventions for disadvantaged children (Cunha et al. 2006).

Little is known about the mechanisms of these effects. Although many intervention studies show that interventions can have positive effects on improving education and reducing youth crime, these studies do not reveal whether these effects work through separate paths, or whether this is indeed the result of an interrelationship. Therefore, we document studies that analyze the effects of education on youth crime and studies that establish the relationship from early criminal behavior to education.

The studies that focus on identifying the effects of education on criminal behavior of young people find that being in school keeps juveniles from being engaged in crime, in particular property crime. Second, not attending school increases the probability of being
incarcerated among juveniles. Both types of findings can be explained by incapacitation effects of school. Third, expansion of educational attainment reduces the probability of criminal involvement of young people. The exact mechanism of this effect is not identified, though it is possible that higher educational attainment favorably influences emotional development, patience, risk aversion and other skills of young people that are negatively related to criminal behavior. Finally, being in post-compulsory education (with higher quality education and/or better peers) has a reducing effect on criminal behavior for juveniles from socially disadvantaged backgrounds.

Studies that focus on identifying the effect of criminal activities on educational outcomes find that criminal behavior in adolescence provokes negative outcomes in school graduation and school attendance. Violence in schools, moreover, results in lower educational attainment. The reviewed studies that examine the effects of early criminal behavior on educational attainment provide strong cor relational evidence. In general, exogenous variation in youth crime is very rare, which makes it difficult to establish causal links.

Generally, this study concludes that evidence for a relationship between education and youth crime is convincing, although the exact dynamics of this connection are still largely unknown. It follows that policies aimed at the combating or preventing of criminal behavior or improving educational outcomes should take this interrelationship into account. Further research can contribute by examining the mechanisms between education and youth crime outcomes and by investigating what are the most effective components of childhood and adolescence interventions for educational and social behavior outcomes. Moreover, more evidence is needed on the effects of early criminal behavior on educational outcomes.
References


Table 1. Summary of studies examining early childhood interventions on education and youth crime

<table>
<thead>
<tr>
<th>Program</th>
<th>Study</th>
<th>Start &amp; country</th>
<th>Target group</th>
<th>Age</th>
<th>Content</th>
<th>Evaluation design</th>
<th>Follow-up age</th>
<th>Educational outcomes</th>
<th>Crime outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFP</td>
<td>Eckenrode et al., 2010</td>
<td>1977; U.S.</td>
<td>Low SES families; Asian, African, American, Latino, White</td>
<td>0-2y</td>
<td>Home visits during mother’s pregnancy and from birth through the child’s second birthday</td>
<td>2 Yes NA 15, 19</td>
<td>No effect No effect</td>
<td>Reduction in crime (for girls)</td>
<td></td>
</tr>
<tr>
<td>IHDP</td>
<td>McCormick et al., 2006</td>
<td>1985; U.S.</td>
<td>Low SES; low birth weight newborns</td>
<td>0 – 36m</td>
<td>Weekly and bi-weekly home visits; center-based care; parent group meetings (a) Nutritional supplement (b) Psychological stimulation (c) Both supplement and stimulation</td>
<td>3 Yes 18 Mixed No effect</td>
<td>Positive but not statistically significant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jamaica Study</td>
<td>Walker et al., 1990; 2005; 2011</td>
<td>1986; Jamaica</td>
<td>Low SES; ethnic minorities</td>
<td>9-24m</td>
<td>(a) Nutritional supplement (b) Psychological stimulation (c) Both supplement and stimulation</td>
<td>2 Yes T(a)=32 T(b)=30 Positive (weak)</td>
<td>18-22 Mixed. Treatment group that received stimulation was less likely to be suspended from school.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ABC</td>
<td>Clarke &amp; Campbell, 1998; Campbell et al., 2002</td>
<td>1972 U.S.</td>
<td>At-risk children</td>
<td>6w/3m/5/8y</td>
<td>Full-time center-based childcare</td>
<td>5 Yes T=57 C=54 12, 15 Positive Positive No effect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CARE</td>
<td>Clarke &amp; Campbell, 1998; Campbell et al., 2002</td>
<td>1978; U.S.</td>
<td>Children from high-risk and low-risk families</td>
<td>6w/3m/5/8y</td>
<td>(a)Full-time center-based childcare + home visit; (b) home visit only</td>
<td>2 Yes T(a)=16 T(b)=25 Positive Positive (for girls) Reduction in marijuana use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HighScope Perry</td>
<td>Schweinhart &amp; Weikart, 1997; Schweinhart et al., 2005; Heckman et al., 2010</td>
<td>1962; U.S.</td>
<td>Low SES &amp; low IQ scores; African Americans</td>
<td>3/4 – 5y</td>
<td>School-year part-day Preschool program Home visits.</td>
<td>2 Yes T=58 C=65 14, 15, 19 Positive Positive (for girls) Positive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicago CPC</td>
<td>Reynolds &amp; Temple, 1995; Reynolds et al., 2001</td>
<td>1967; U.S.</td>
<td>Low SES</td>
<td>3/4-6/9y</td>
<td>Preschool: Half-day school-year program School-age: Kindergarten and primary (to 3rd grade) programs, Preschool program. Nutrition programs. Home visits.</td>
<td>3 No T=1,150 C=389 13, 18-20 Positive Positive (reading, math; less retention) Positive (high school diploma), more sizable effects for males Positive (less arrests and violent arrests)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head Start</td>
<td>Currie, 2001; Garcés et al. 2002; Deming, 2009</td>
<td>1965; U.S.</td>
<td>Low SES</td>
<td>3 – 4y</td>
<td></td>
<td>2 No NA 21 Positive (weak) Mixed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FDPR</td>
<td>Lally et al., 1988</td>
<td>1969-1976; U.S.</td>
<td>Low SES</td>
<td>6m - 5y</td>
<td>Home visits, day care</td>
<td>5 No 108 families The eighth grade Positive</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: T= treatment group, C= control group, Random Assign. = random assignment. Sample size varies across studies, with sample sizes ranging from 108 families to 1,150 participants. Educational outcomes and crime outcomes are reported for various ages, with mixed results indicating both positive and no effect findings for educational outcomes and crime prevention. The studies reflect different geographical locations and target populations, with some focusing on low SES families, low birth weight newborns, and ethnic minorities. The interventions range from home visits, center-based care, and parent group meetings to full-time center-based childcare, educational programs, and home visits.
Table 2. Summary of studies examining interventions in early school age

<table>
<thead>
<tr>
<th>Program</th>
<th>Study</th>
<th>Start &amp; country</th>
<th>Target group</th>
<th>Age</th>
<th>Content</th>
<th>Evaluation design</th>
<th>Follow-up</th>
<th>Educational outcomes</th>
<th>Crime outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSDP</td>
<td>Hawkins et al., 2001; Durlak et al., 2011</td>
<td>1985; U.S.</td>
<td>White, African Americans, Native Americans, other racial groups; low SES</td>
<td>5th grade</td>
<td>In-service teacher training, parenting classes, social competence training for children</td>
<td>6</td>
<td>Yes</td>
<td>808 children and parents</td>
<td>Age 18, 21</td>
</tr>
<tr>
<td>MLES</td>
<td>Tremblay et al., 1992, 1996; Boisjoli et al., 2007</td>
<td>1984; Canada</td>
<td>Boys from low SES, risk behavior; children from Canadian-born parents</td>
<td>6-7 years (1st and 2nd grade)</td>
<td>Preventive Treatment Training, social skills training for children, parents and teachers</td>
<td>2</td>
<td>Yes</td>
<td>T=69 C=181</td>
<td>Age 11, 12, 13, 21</td>
</tr>
<tr>
<td>LA's BEST</td>
<td>Goldschmidt &amp; Huang, 2007; Huang et al., 2008, 2009</td>
<td>1988; U.S.</td>
<td>Low SES, low academic performance; disadvantaged neighborhoods; 80% Hispanic; 12% African Americans, 8% others.</td>
<td>Kindergarten - 5th grade</td>
<td>After-school program, learning and social activities provided by well-trained staff</td>
<td>5-6</td>
<td>No</td>
<td>N=28,000 per year</td>
<td>NA</td>
</tr>
<tr>
<td>Program</td>
<td>Study</td>
<td>Start &amp; country</td>
<td>Target group</td>
<td>Age</td>
<td>Content</td>
<td>Evaluation design</td>
<td>Follow-up</td>
<td>Educational outcomes</td>
<td>Crime outcomes</td>
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<tr>
<td>BBBS</td>
<td>Tierney et al., 1995; Grossman &amp; Tierney, 1998</td>
<td>1992; U.S.</td>
<td>Low SES, single-parent households; African American, Hispanic, biracial, Native Americans</td>
<td>10-16</td>
<td>Mentoring programs, meeting with volunteer mentors</td>
<td>1</td>
<td>Yes</td>
<td>18 months after the random assignment</td>
<td>Positive (for girls)</td>
</tr>
<tr>
<td>QOP</td>
<td>Rodriguez-Planas, 2012</td>
<td>1995; U.S.</td>
<td>High-risk juveniles; Afro Americans, Hispanic</td>
<td>14-15</td>
<td>Mentoring, educational services, financial rewards</td>
<td>5</td>
<td>Yes</td>
<td>Age 19; 21</td>
<td>Positive (weak)</td>
</tr>
<tr>
<td>ChalleNGe</td>
<td>Bloom et al., 2009; Millenky et al., 2011; Millenky et al., 2013</td>
<td>1993; U.S.</td>
<td>High school dropouts, unemployed. 80% participants are male.</td>
<td>16-18</td>
<td>Participants live at the program site (often on a military base). Education and training</td>
<td>1</td>
<td>Yes</td>
<td>During and shortly after the program</td>
<td>Positive</td>
</tr>
<tr>
<td>Job Corps</td>
<td>Schochet et al., 2008</td>
<td>1994; U.S.</td>
<td>Disadvantaged youth, low SES</td>
<td>16-21</td>
<td>Help in finding work, training</td>
<td>1</td>
<td>Yes</td>
<td>N=15,400</td>
<td>During and shortly after the program</td>
</tr>
<tr>
<td>EMA</td>
<td>Ashworth et al., 2001, 2002; Heaver et al., 2002; Feinstein &amp; Sabates, 2005; Heller et al., 2013</td>
<td>1999; U.K.</td>
<td>Areas with high economic deprivation, low SES, females and males</td>
<td>16-18</td>
<td>A weekly money allowance paid either to young people or their parents.</td>
<td>2</td>
<td>No</td>
<td>N=11,169</td>
<td>One year after the first interview</td>
</tr>
<tr>
<td>BAM</td>
<td>Ferwerda et al., 2006; Rud et al., 2013</td>
<td>2009; U.S.</td>
<td>Disadvantaged males 7th, 10th grade</td>
<td>12-18</td>
<td>Interaction with pro-social adults, after-school programming, cognitive behavioral therapy</td>
<td>1</td>
<td>Yes</td>
<td>N=2,740</td>
<td>One year after the random assignment</td>
</tr>
<tr>
<td>Halt</td>
<td>Ferwerda et al., 2003-2004; the Netherlands</td>
<td>2003-2004; the Netherlands</td>
<td>Juvenile offenders; White and other racial groups</td>
<td>12-18</td>
<td>Community work, learning assignments</td>
<td>1</td>
<td>Yes</td>
<td>T=465 C=480</td>
<td>1-5 years after the program</td>
</tr>
</tbody>
</table>
### Table 4. Summary of studies examining the effect of education on youth crime

<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Source (crime data)</th>
<th>Research population</th>
<th>Sample</th>
<th>Evaluation method</th>
<th>Input variable</th>
<th>Criminal behaviour outcomes</th>
<th>Property crime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landersø et al., 2013</td>
<td>Denmark</td>
<td>Official records</td>
<td>Males &amp; females aged up to 18</td>
<td>98,929</td>
<td>2SLS</td>
<td>School attendance</td>
<td>Reduction for girls</td>
<td>Reduction</td>
</tr>
<tr>
<td>Aaslund et al., 2012</td>
<td>Sweden</td>
<td>Official records</td>
<td>Males and females aged 16 and above</td>
<td>116,787</td>
<td>2SLS</td>
<td>Educational attainment</td>
<td>No significant effect</td>
<td>Reduction</td>
</tr>
<tr>
<td>Anderson, 2012</td>
<td>U.S.</td>
<td>Official records</td>
<td>Males and females aged 16 and above</td>
<td>116,787</td>
<td>2SLS</td>
<td>Educational attainment</td>
<td>Reduction for boys</td>
<td>Reduction</td>
</tr>
<tr>
<td>Aslund et al., 2012</td>
<td>Sweden</td>
<td>Official records</td>
<td>Males &amp; females aged up to 18</td>
<td>98,929</td>
<td>2SLS</td>
<td>Educational attainment</td>
<td>Reduction in the probability of arrest rates for individuals aged 16-18</td>
<td>Reduction</td>
</tr>
<tr>
<td>Anderson, 2012</td>
<td>U.S.</td>
<td>Official records</td>
<td>Males &amp; females aged 16 and above</td>
<td>116,787</td>
<td>2SLS</td>
<td>Educational attainment</td>
<td>Reduction in the probability of criminal behaviour of individuals aged between 16 and 21</td>
<td>Reduction in the probability of imprisonment</td>
</tr>
<tr>
<td>Machin et al., 2012</td>
<td>U.K.</td>
<td>Official records</td>
<td>Males &amp; females aged 16-21</td>
<td>125</td>
<td>2SLS</td>
<td>Educational attainment</td>
<td>Reduction in the probability of committing crime and being incarcerated at age 19-22</td>
<td>Increase</td>
</tr>
<tr>
<td>Hjalmarsson, 2008</td>
<td>U.S.</td>
<td>Self-reports</td>
<td>Afro-Americans; males aged 13 to 22</td>
<td>9,000</td>
<td>Multinomial discrete choice vector autoregression model</td>
<td>Not attending school at age 16 (school dropout)</td>
<td>Increase</td>
<td></td>
</tr>
<tr>
<td>McGarvey, Smith, &amp; Walker, 2007</td>
<td>U.S.</td>
<td>Official records</td>
<td>Students in schools in Atlanta, U.S.</td>
<td>61 elementary schools and 13 middle schools</td>
<td>OLS and 2SLS</td>
<td>Violent incidents in schools and in the neighbourhood</td>
<td>In-school violent crime is associated with lower academic pass rates.</td>
<td></td>
</tr>
<tr>
<td>Webbink et al., 2012</td>
<td>Australia</td>
<td>Retrospective self-reports</td>
<td>Twins aged 24 to 36</td>
<td>6,267</td>
<td>OLS, fixed effects on the twins level</td>
<td>Arrest before age of 18</td>
<td>Reduction in the probability of completing senior high school.</td>
<td></td>
</tr>
</tbody>
</table>

### Table 5. Summary of studies examining the effect of risky behavior on educational outcomes

<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Source (crime data)</th>
<th>Research population</th>
<th>Sample</th>
<th>Evaluation method</th>
<th>Input variable</th>
<th>Educational outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hjalmarsson, 2008</td>
<td>U.S.</td>
<td>Self-reports</td>
<td>27% Afro-Americans; 21% Hispanics; rest - Whites</td>
<td>7,417</td>
<td>Linear probit</td>
<td>Arrest, charge, incarceration and conviction in age of 16 (or before)</td>
<td>Reduction in the probability of high school graduation.</td>
</tr>
<tr>
<td>McGarvey, Smith, &amp; Walker, 2007</td>
<td>U.S.</td>
<td>Official records</td>
<td>Students in schools in Atlanta, U.S.</td>
<td>61 elementary schools and 13 middle schools</td>
<td>OLS and 2SLS</td>
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<td>In-school violent crime is associated with lower academic pass rates.</td>
</tr>
<tr>
<td>Webbink et al., 2012</td>
<td>Australia</td>
<td>Retrospective self-reports</td>
<td>Twins aged 24 to 36</td>
<td>6,267</td>
<td>OLS, fixed effects on the twins level</td>
<td>Arrest before age of 18</td>
<td>Reduction in the probability of completing senior high school.</td>
</tr>
</tbody>
</table>